

CS 61BL
Summer 2022

Final
Friday August 12, 2022

Intro: Welcome to the CS61BL Final!

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Your SID: 3037/00229

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Many of the problems on this exam consist of multiple choice or fill in the blank questions. Make sure to read the directions carefully!

There are also a few code writing questions. You may not need to use all lines provided. If you are given skeleton code to fill in, we will not grade your answer if you alter the skeleton code. If you are given a line limit, we will not grade your answer if you go over the line limit or if you don't properly format your code in the attempt of using fewer lines. For instance, the properly formatted code below takes 9 lines, counting the function signature and closing brace. You may not use ternary operators or lambda functions.

```
1 public static boolean function() {  
2     for (int i = 0; i < 10; i += 2) {  
3         if (i == 2) {  
4             i -= 1;  
5         } else {  
6             i += 1;  
7         }  
8     }  
9 }
```

However, the code below is **not**, as there are a number of mistakes!

```
1 public static boolean function() {  
2     for (int i = 0; i < 10; i += 2) {  
3         if (i == 2) { i -= 1; } //We will count this conditional as 3 lines!!  
4         else { i += 1; }  
5     }
```

Additionally, we will not grade your question if you fail to follow any restrictions given in the problem statement. Your code won't be checked by a compiler, but we will take off points for errors that are more than a typo. Please pay attention to detail when answering coding questions!

Problem 1: Exam Policy

(1 Point) Please check the following boxes to confirm that you understand the exam proctoring policy!

FOR ONLINE TEST TAKERS

- ☒ I understand that I may not use any internet resources or communicate with anyone during the exam.
- ☒ I am screen recording, sharing my entire desktop, unmuted and have quit and closed all tabs and background applications other than this exam pdf/answer sheet, the Exam Announcements Tool, Zoom or my local recording software, and the Exam Proctoring Policy.
- ☒ I understand that I should periodically check the Exam Announcements Tool for important clarifications about the exam. This is my responsibility and failure to do so could result in me not getting all information about the exam.
- ☒ I understand that the 30 extra minutes I am given are only to submit to gradescope.
- ☒ I understand that if I alter the skeleton code (unless otherwise specified), go over the line limit, or fail to follow any restrictions given in the problem statement of a coding question, then my answer will not be graded.

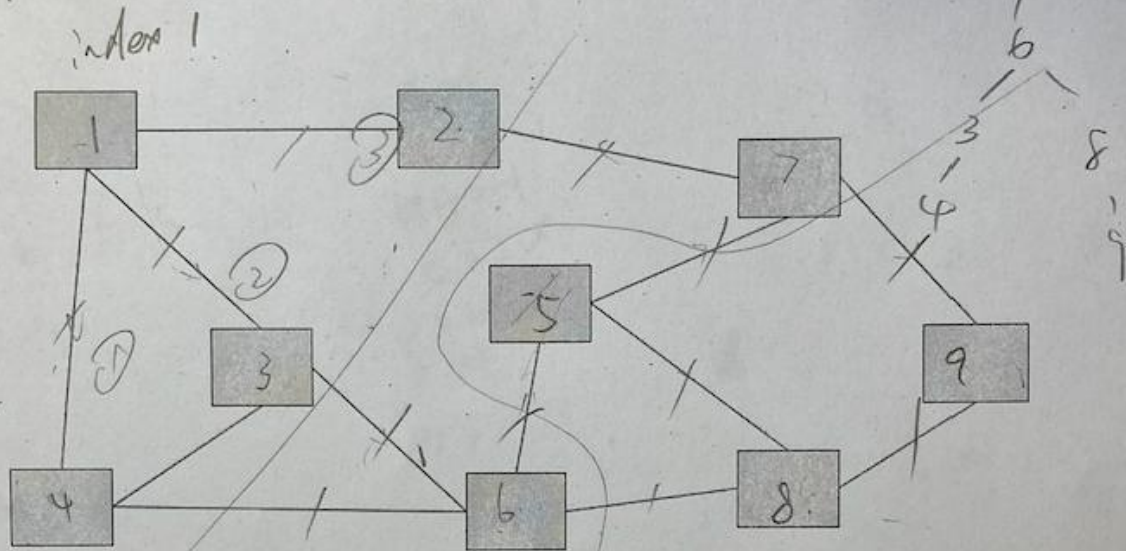
FOR IN PERSON TEST TAKERS

- ☐ I understand that I may not use any internet resources or communicate with anyone during the exam.
- ☐ I understand that I should periodically check the Exam Announcements Tool for important clarifications about the exam. This is my responsibility and failure to do so could result in me not getting all information about the exam.
- ☐ I understand that if I alter the skeleton code (unless otherwise specified), go over the line limit, or fail to follow any restrictions given in the problem statement of a coding question, then my answer will not be graded.

Problem 2

(3.75 Points) See Exam PDF for Problem Statement and instructions

a) 1.75 Points



b) 0.5 Points

Answer: 3

c) 0.5 Points

Answer 1: 1

d) 0.5 Points

Answer: 3

e) 0.5 Points

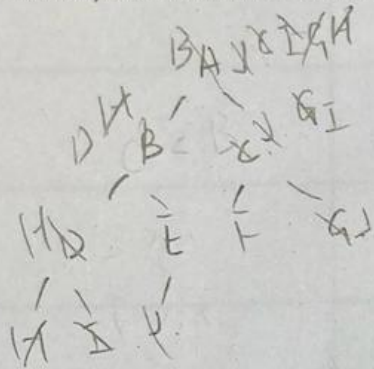
Answer: 2 9 12Answer 2: 3

	1	2	3	4	5	6	7	8	9
1		T							
2							F		
3									
4									
5									
6									
7					T				
8									
9									

fringe

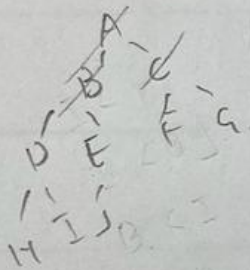
Problem 3

(5 Points) See Exam PDF for Problem Statement and instructions

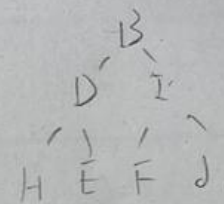


$A > J$ ✓
 $C > B$ ✓
 $C > J$ ✓
 $G > F$ ✓
 $G > J$ ✓
 $C > I$ ✓
 $G > B$ ✓
 $G > I$ ✓

$- A$ ✓
 $T C$ ✓
 $F G$ ✓



$I > F$
 $I > J$
 $B > H$
 $B > I$ ✓
 $D > H$
 $D > E$
 $D > I, H$

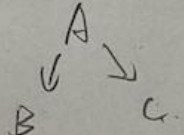


a) 1 Point

Answer: 03

b) 3 Points

$A > C > G > B > D > I, H > F, J, H$



DO NOT FILL IN	DO NOT FILL IN	DO NOT FILL IN
A	>	J
H	<	G
F	?)
E	<	D
H	?	E
C	>	B
C	>	I

c) 1 Point

Answer: A B C D E F G H I J . A

Problem 4

(6 Points) See Exam PDF for Problem Statement and instructions

a) 2 Points

- ☒ Selection \rightarrow unstable
☒ Heap sort \rightarrow unstable
☐ Quick sort \rightarrow unstable
☒ Merge sort \rightarrow stable

b) 2 Points

Answer 1: [8, 1, 8, 7]Answer 2: DNEAnswer 3: [8, 2, 8, 9]Answer 4: DNE

0 8 9 7 7

8 9 7
1 8 8 7
1 1

1 8 8
1, 2, 3, 3, 4

2 3

3 4 8, 1, 8, 7

8
7 1 8

7 1 8
1

c) 1 Point

[8 1 5 6 8 9 10 11]

[8, 1, 5, 6] [8, 9, 10, 11]

[8, 1] [5, 6] [8, 9] [10, 11]

1 8 5 6 8 9 10 11

1 5 6 8 8 9 10 11

A: 1B: 9C: 5D: 10

d) 1 point

Answer: [101, 1, 303, 710, 920, 943, 82]

1st
710
920
101
1
82
303
943

2nd
101
303
710
920
943
82

Problem 6

(4.5 points)

 Θ
 $N(\text{resize}) = N$ linked list insert = N

a) 0.5 Points

- ☒ $\Theta(1)$ ☐ $\Theta(\log(\log N))$ ☐ $\Theta(\log N)$ ☐ $\Theta((\log N)^2)$ ☒ $\Theta(N)$ ☐ $\Theta(N \log N)$ ☐ $\Theta(N^2)$
☐ $\Theta(N^2 \log N)$ ☐ $\Theta(N^3)$ ☐ $\Theta(N^3 \log N)$ ☐ $\Theta(N^4)$ ☐ $\Theta(N^4 \log N)$ ☐ $\Theta(2^N)$ ☐ $\Theta(3^N)$
☐ Worse than $\Theta(3^N)$ ☐ Never terminates (infinite loop)

b) 0.5 Points

- ☒ $\Theta(1)$ ☐ $\Theta(\log(\log N))$ ☐ $\Theta(\log N)$ ☐ $\Theta((\log N)^2)$ ☐ $\Theta(N)$ ☐ $\Theta(N \log N)$ ☐ $\Theta(N^2)$
☐ $\Theta(N^2 \log N)$ ☐ $\Theta(N^3)$ ☐ $\Theta(N^3 \log N)$ ☐ $\Theta(N^4)$ ☐ $\Theta(N^4 \log N)$ ☐ $\Theta(2^N)$ ☐ $\Theta(3^N)$
☐ Worse than $\Theta(3^N)$ ☐ Never terminates (infinite loop)

c) 1 Point

- ☒ Yes ☐ No, because if two objects have the same hash code

d) 0.5 Points

- ☐ Constant ☐ $\log(\log N)$ ☐ $\log N$ ☐ $(\log N)^2$ ☒ N ☐ $N \log N$ ☐ N^2 ☐ $N^2 \log N$ ☐ N^3
☐ $N^3 \log N$ ☐ N^4 ☐ $N^4 \log N$ ☐ 2^N ☐ 3^N ☐ Worse than 3^N ☐ Never terminates (infinite loop)

e) 0.5 Points

- ☐ $\Theta(1)$ ☐ $\Theta(\log(\log N))$ ☐ $\Theta(\log N)$ ☐ $\Theta((\log N)^2)$ ☒ $\Theta(N)$ ☐ $\Theta(N \log N)$ ☐ $\Theta(N^2)$
☐ $\Theta(N^2 \log N)$ ☐ $\Theta(N^3)$ ☐ $\Theta(N^3 \log N)$ ☐ $\Theta(N^4)$ ☐ $\Theta(N^4 \log N)$ ☐ $\Theta(2^N)$ ☐ $\Theta(3^N)$
☐ Worse than $\Theta(3^N)$ ☐ Never terminates (infinite loop)

f) 0.5 Points

☐ Always
 ☐ Sometimes
 ☒ Never

g) 0.5 Points

☒ $\Theta(1)$
 ☐ $\Theta(\log(\log N))$
 ☐ $\Theta(\log N)$
 ☐ $\Theta((\log N)^2)$
 ☐ $\Theta(N)$
 ☐ $\Theta(N \log N)$
 ☐ $\Theta(N^2)$
☐ $\Theta(N^2 \log N)$
☐ $\Theta(N^3)$
☐ $\Theta(N^3 \log N)$
☐ $\Theta(N^4)$
☐ $\Theta(N^4 \log N)$
☐ $\Theta(2^N)$
☐ $\Theta(3^N)$
☐ Worse than $\Theta(3^N)$
☐ Never terminates (infinite loop)

h) 0.5 Points

☐ $\Theta(1)$
☐ $\Theta(\log(\log N))$
☒ $\Theta(\log N)$
☐ $\Theta((\log N)^2)$
☐ $\Theta(N)$
☐ $\Theta(N \log N)$
☐ $\Theta(N^2)$
☐ $\Theta(N^2 \log N)$
☐ $\Theta(N^3)$
☐ $\Theta(N^3 \log N)$
☐ $\Theta(N^4)$
☐ $\Theta(N^4 \log N)$
☐ $\Theta(2^N)$
☐ $\Theta(3^N)$
☐ Worse than $\Theta(3^N)$
☐ Never terminates (infinite loop)

Problem 7

(10 points)

Node V	H(V)	distance	toV
A	2	2	
B	1	8	D
C	3	1	
D	0	0	
E	3	5	
F	2	4 3	
G	2	3	B C
H	3	3	

BFS(D)

D-B-A-F-G-C-E, H.

Fringe.

(D 0)

(B 1)

(A 2)

(C 3)

(F 4)

(G 5)

(H 6)

(E 8)

D

B

A

C

G

F

H

E

a) 2 points

Answer: B D B A C G F H E

b) 1 point

2	8	3	0	6	4	3	∞
A	B	C	D	E	F	G	H

c) 1 point

$\{a: X, b: X, c: X, d: X, e: 9, f: 6, g: 5, h: \infty\}$

d) 2 points

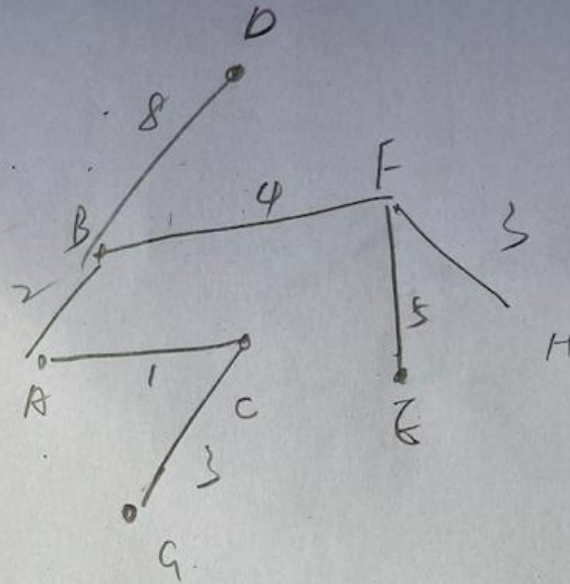
Answer: n

Answer 2: 1

Answer 3: 1

Answer 4: n

See Exam PDF for Problem Statement and instructions



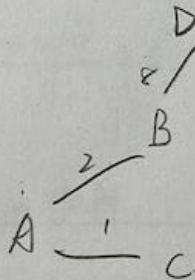
e) 1 point

☒ A, B ☒ A, C ☒ B, D ☐ B, G ☒ B, F
☐ C, E ☐ C, F ☒ C, G ☒ E, F ☐ E, H
☒ F, H

f) 1 point

Answer: fe

g) 0.5 points


☒ True ☐ False

h) 0.5 points

☒ True ☐ False

i) 0.5 points

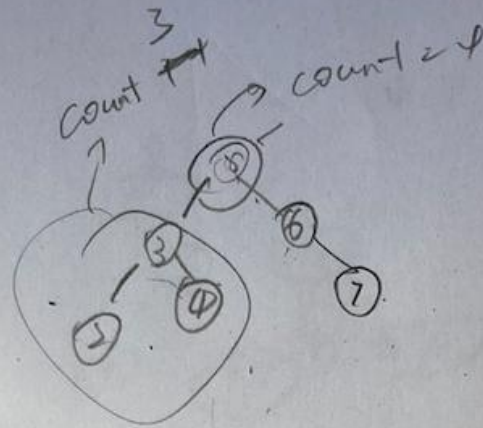
☒ Always ☐ Sometimes ☐ Never

j) 0.5 points

☐ ☒ ☐ ☐ ☒

Problem 8

(5.75 Points)



a) 1 Point

☐
☐
☐
☐
☐
☐
☐
☐

b) 4.75 Points

```

public   (, ) {
    if ( $k > 0$  &  $n \neq null$ ) {
        return null;
    }

     =  $k$ thSmallestElement( $n.left$ ,  $k - count$ );

    if () {
        ;
    }

     $count++$ ;

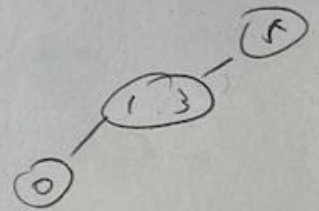
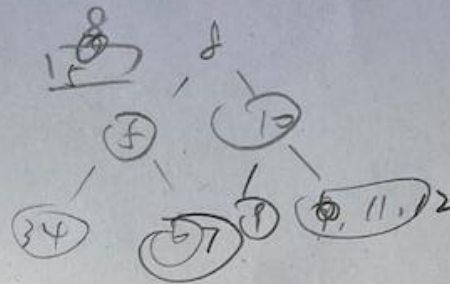
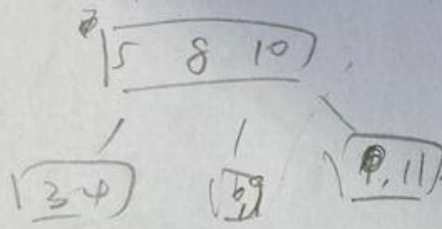
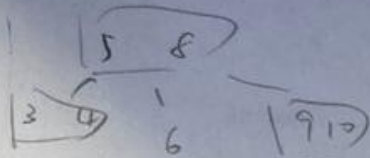
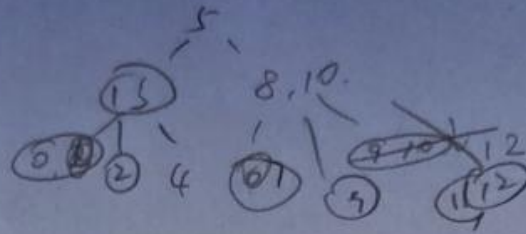
    if ( $count == k$ ) {
        return  $n.value$ ;
    }

    return  $k$ thSmallestElement( $n.right$ ,  $k$ );
}

```


Problem 9:

(8 Points)



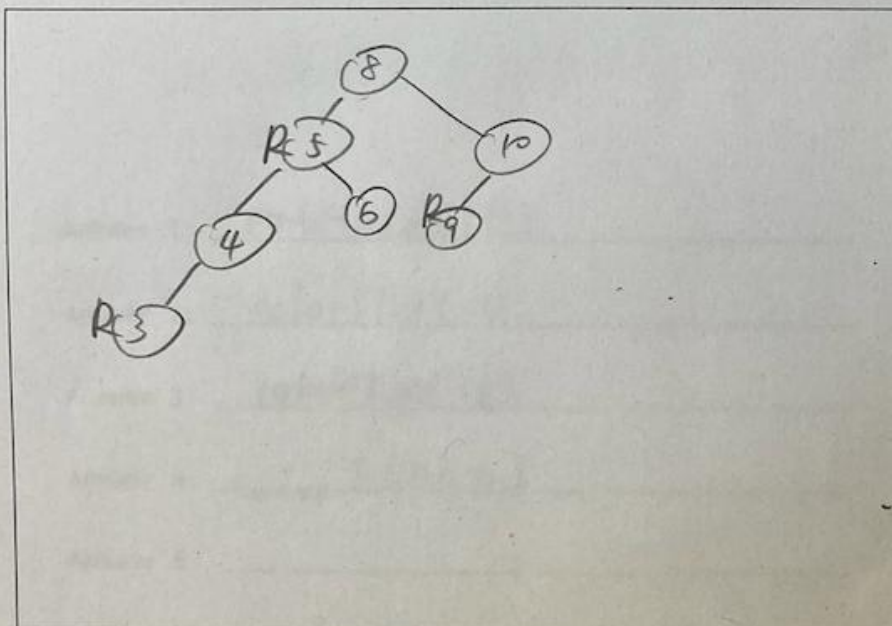
a) 0.5 Points

Answer: 1

b) 1 Point

Answer: 7

c) 2 Points

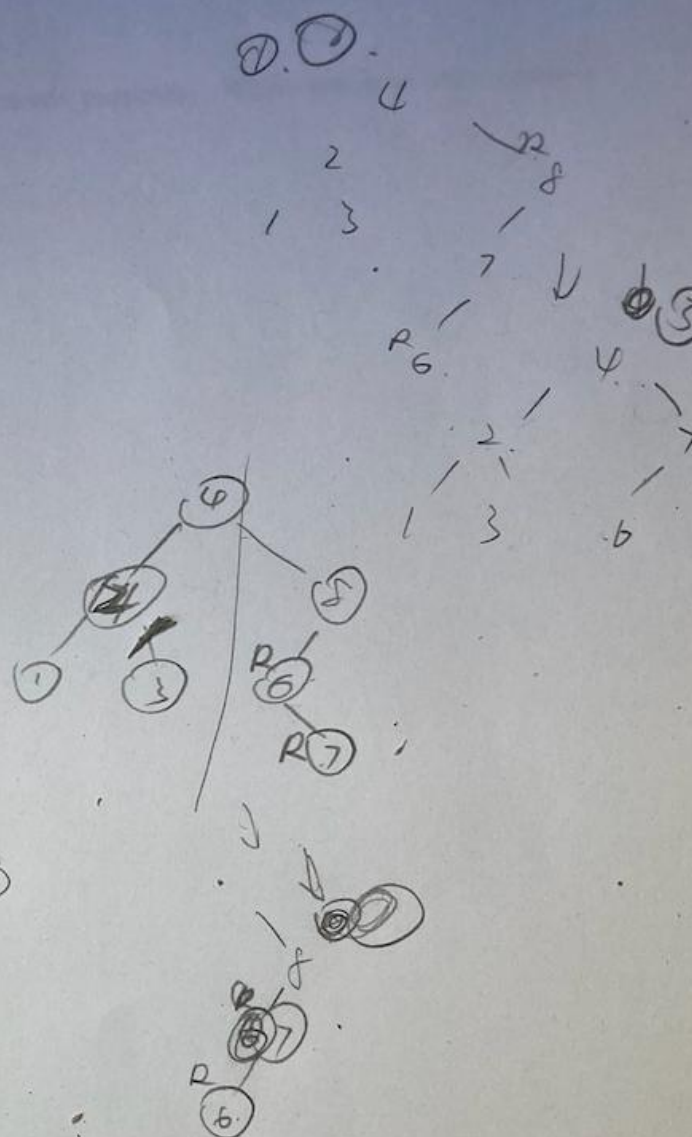
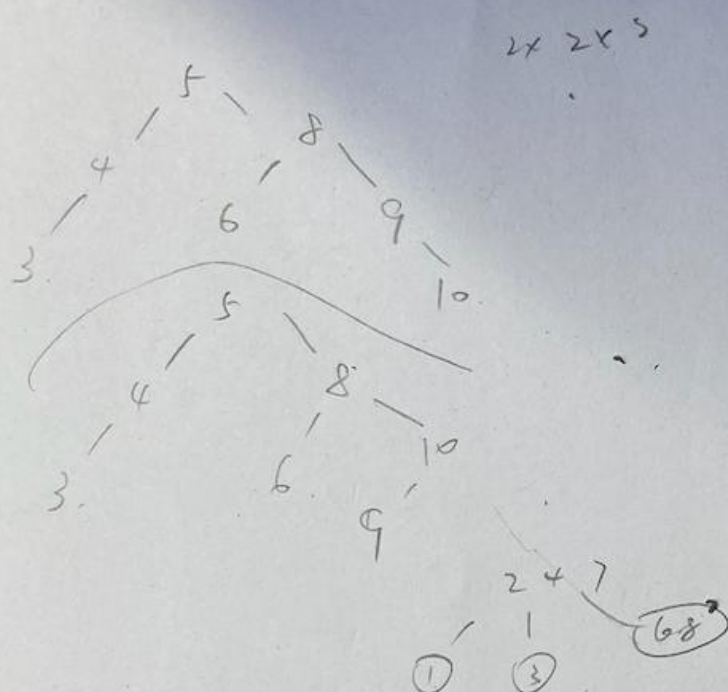


d) 0.5 Points

Answer: 1

e) 1 Point

Answer: 8



f) 3 Points

Answer 1: rotateLeft(6).

Answer 2: colorFlip(7).

Answer 3: rotateRight(8).

Answer 4: colorFlip(4).

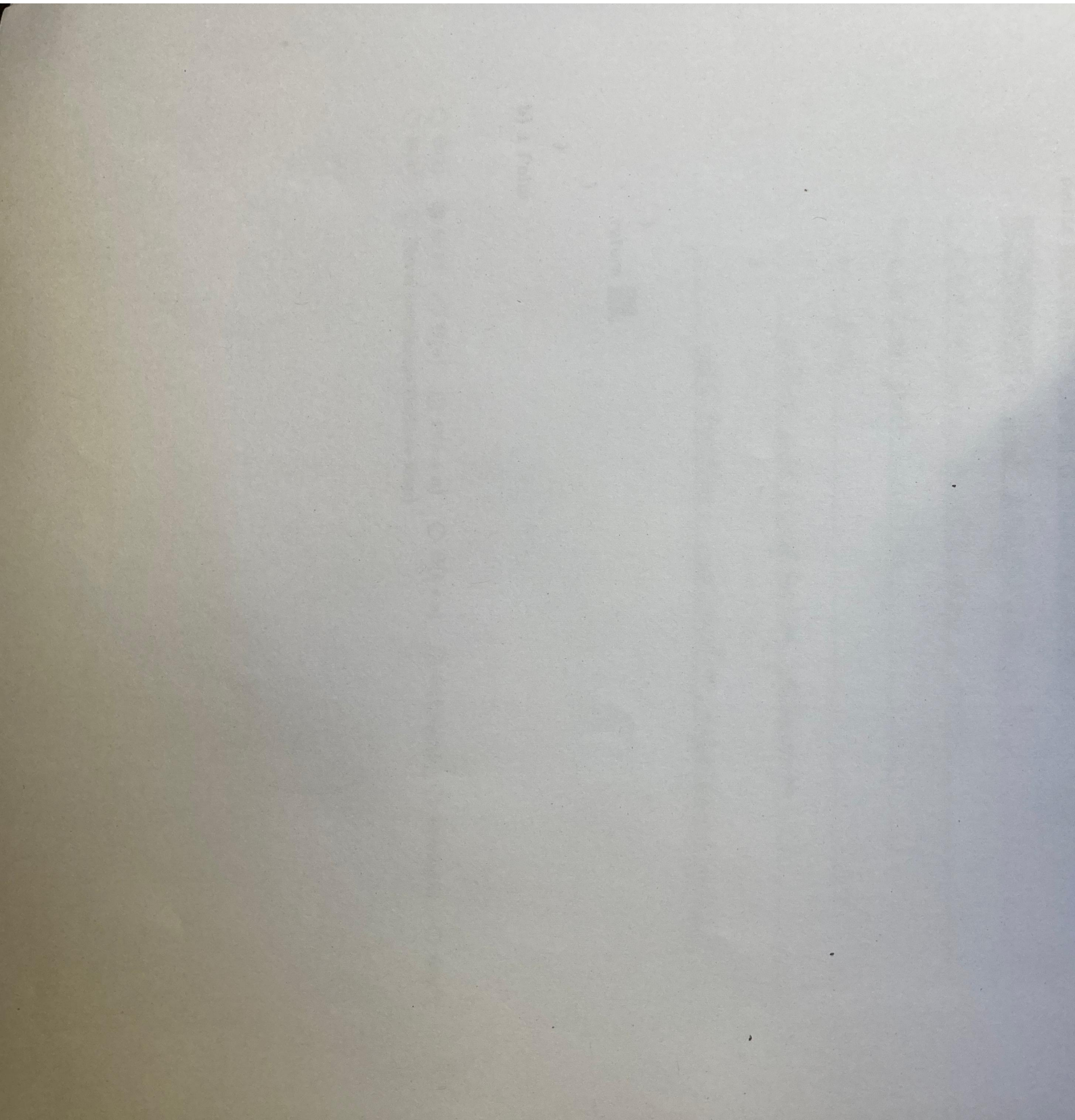
Answer 5: _____

Answer 6: _____

Problem 10

(10 Points)

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a) 4 Points

```

public class [redacted] {
    [redacted];

    public [redacted] [redacted] ([redacted]) {
        [redacted] = new ArrayList<String> ();
        choiceNode currSituation = root;
        for (boolean path : choices) {
            if (path) {
                out add (currSituation get situation());
            }
            currSituation = currSituation.makechoice(path);
        }
        return [redacted];
    }
}

```

b) 1 Point

- ☐ $\Theta(1)$
 ☒ $\Theta(k)$
 ☐ $\Theta(n)$
 ☐ $\Theta(k+n)$
 ☐ $\Theta(k*n)$
 ☐ $\Theta(k \log n)$
 ☐ $\Theta(n \log k)$
 ☐ $\Theta(n^2)$
☐ $\Theta(k^2)$
☐ Never terminates (infinite loop)

c) 5 Points

```

public class [REDACTED] {
    [REDACTED];

    public [REDACTED] [REDACTED] ([REDACTED], [REDACTED]) {
        [REDACTED];
        if ([REDACTED]) {
            out.add(new LinkedList<Boolean>());
            return [REDACTED];
        }
        [REDACTED] = pathsForward(n.makeChoice(true), h-1);
        [REDACTED] = pathsForward(n.makeChoice(false), h-1);

        for (List<Boolean> tt : t) {
            out.add(new LinkedList<Boolean>(true, tt));
            out.add(new LinkedList<Boolean>(false, tt));
        }
        for (List<Boolean> ff : f) {
            out.add(new LinkedList<Boolean>(true, ff));
            out.add(new LinkedList<Boolean>(false, ff));
        }
        return [REDACTED];
    }
}

```


Problem 11: ~ I'msoquirkyandunique ~
(1 Potential Extra Credit Point)

What could this be...

Choice: $l\psi$